

EFFECTS OF PROBLEM-BASED SCHEDULING ON PATIENT WAITING AND STAFF UTILIZATION OF TIME IN A PEDIATRIC CLINIC

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The patient scheduling system in a pediatric outpatient clinic was changed from time-based to problem-based in an A-B-A-B reversal design. During baseline, time-based scheduling was in effect with patients being scheduled in 15-min periods regardless of presenting problem. During intervention, a receptionist matched client problems with time slots so that a more extensive treatment was allocated more time. Problem-based scheduling resulted in a substantial decrease in mean number of minutes spent in clinic across all presenting problems. Waiting time increased to baseline levels when problem-based scheduling was removed and decreased again on reintroduction of the program. A follow-up check conducted 1 month after the end of the second intervention phase revealed that the effects were maintained. The problem-based schedule also resulted in an increase in the proportion of extra time that medical staff had available and produced a positive consumer response.

DESCRIPTORS: antecedent control, behavioral pediatrics, staff management, children, patient scheduling systems

Most research on staff management has focused on how various consequences influence staff behavior. Although consequence interventions have been found to be reliable and effective in changing behavior, they suffer from two limitations. First, a peak level of behavior may be difficult to maintain after several weeks of intervention (e.g., Iwata, Bailey, Brown, Foshee, & Alpern, 1976). Second, their implementation usually requires additional resources for monitoring and evaluation of delivery of response-contingent consequences. Accordingly, researchers have begun to examine changes in antecedent conditions as a method of maintaining optimum levels of behavior over long periods of time (Sulzer-Azaroff, 1982).

One type of antecedent variable that is often important to performance is work scheduling, es-

pecially in settings in which medical or mental health treatment is provided. An efficient scheduling system provides for the delivery of medical care in the most efficient manner for both patients and staff (Rochart & Hofmann, 1969). An ideal scheduling system should (a) maximize the number of patients the staff sees in a specified period of time, (b) minimize patient waiting without impairing the entire system (i.e., decrease staff efficiency), and (c) maximize the use of support staff (e.g., nurses, aides) and examining rooms (Smith & Smith, 1984).

Block scheduling, modified block scheduling, and individual scheduling are the three major scheduling systems currently used in medical settings. Block scheduling is the most commonly used patient appointment system (Motil & Siar, 1973). With block scheduling, all patients are scheduled for one appointment time. For example, all morning patients are scheduled for 8:15 a.m. and all afternoon patients are scheduled for 1:00 p.m. The major problem with this method of scheduling is that it results in long waiting periods for patients prior to contact with the physician.

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A modified block schedule can also be used. This method breaks the day into smaller blocks (usually hourly), but as is true with block scheduling, it does not consider a patient's individual time requirements (Roberts, 1977).

Scheduling systems that individualize appointment times have been described. For example, Roberts (1977) proposed that the block scheduling system be replaced by an individual appointment system in which appointment times correspond closely with the availability of resources. Additionally, Green, Dudding, Viren, and Leake (1977) suggested the development of an individualized appointment system in which new patients are scheduled for a fixed length of time, while the length of return patients' appointment times is determined by the physician or nurse practitioner at the time of rescheduling.

Todd (1984) expanded on these methods and proposed a system that would minimize the number of people waiting through the use of an "express" examining room. Similar to the check-out lane at a grocery store in which one lane is used exclusively for people checking out with only a few items, an express examining room could be reserved for patients with minor complaints or for patients who require only a follow-up check to determine if the treatment was successful (e.g., a check-up for an ear infection). Unfortunately, the express format could cause patients to be seen in an order that does not correspond with their order of arrival, thus resulting in complaints or queries from those who might watch several others come and go before they were treated.

A combination of Green et al.'s (1977) individualized appointment system and Todd's (1984) express room may meet the needs of a busy outpatient clinic where there are several physicians and many patients waiting to be seen. This combined system could accommodate appointments with different time requirements by designating specific time slots for different presenting problems.

The purpose of this study was to examine the effects of a problem-based scheduling system on patient time in a clinic and staff utilization of time. Patients were scheduled in time slots designed to

accommodate their specific presenting problems. The daily clinic hours were individually designated for different presenting problems in order to match resources with patient needs and to reduce waiting.

METHOD

Subjects and Setting

This study was conducted in a pediatric group practice (PGP), an outpatient clinic of a university medical center. The full-time PGP staff consisted of three faculty physicians, one nurse practitioner, one registered nurse, one nurse's aide, and one receptionist. Residents and 3rd- and 4th-year medical students also rotated through the clinic. An average of five to seven staff were available on any one day.

Patient Flow

The PGP receptionist and a centralized phone-in outpatient appointment scheduling operation arranged patient appointments. Patients were scheduled using a modified block scheduling system on a first-come, first-served basis as the schedule permitted.

On arrival at the clinic, each patient registered at the receptionist's desk. Following check-in, the patient sat in the PGP waiting area until the nurse or nurse's aid called his or her name. The patient was then taken to the weighing room where vital statistics (e.g., height, weight, temperature) were taken. If an examination room was available, the patient was taken to it immediately. Otherwise, the patient stayed in the weighing room until the next exam room was available. When the exam was finished, the patient left the exam room and checked out of the clinic at the receptionist's desk.

Data Collection

Data were collected on three variables: (a) amount of time the patient spent in the clinic, (b) staff use of time, and (c) patient satisfaction. Data on the amount of time each patient spent in the clinic were collected by the receptionist, nurse, and nurse's aide. The receptionist recorded on a flow sheet the exact time displayed on a digital clock as the patient

entered the clinic. The time of the patient's entry into the weighing room, the patient's presenting problem, and the time of entry into the exam room were recorded on the flow sheet by the nurse or nurse's aide. When the patient left the clinic and checked out with the receptionist, an exit time was recorded by the receptionist.

Staff use of time was assessed through time sample observations. The Physician's Time Utilization Observation System (Todd, 1984) was used to collect data each morning and afternoon. Observation periods ranged from 30 to 60 min and occurred twice daily, with an average duration of 50 min. During each successive minute of the observation period, each staff member was observed for several seconds and his or her activities were coded. Because the clinic was small and because the presence of a provider and client behind a closed exam room door was scored as "with patient," it was possible to sample the behavior of every provider once per minute. The following categories were used for observation purposes: with patient, charting, talking about a patient with another staff member, using the phone, waiting (including non-work-related conversation), miscellaneous activity (e.g., looking for materials), and out of clinic.

Consumer satisfaction data were collected through the use of the PGP Patient Satisfaction Questionnaire, which was developed for this study through consultation with the PGP staff. Since all PGP patients were minors, their parent or care provider was handed the questionnaire with the statement that completion of the form was strictly voluntary and that it could be returned unanswered to the receptionist. A short letter accompanied the questions informing the parents of the purpose of the study and assuring anonymity.

Reliability

The accuracy of the times recorded by the receptionist, nurse, and nurse's aide was monitored twice weekly. An independent observer entered the clinic at unannounced times and recorded the time required for patients to progress through the system. The staff members were unaware of the reliability checks. These times were then compared

to the times written on the flow sheet to assess agreement. Any difference in time recorded (e.g., 9:41 vs. 9:42) was considered a disagreement. Interobserver agreement was calculated by dividing agreements by agreements plus disagreements and multiplying by 100. Overall percentage agreement for recording time was 98.2%, with a range of 96% to 100%.

Interobserver agreement on staff time utilization measures was assessed by independent observers during 15% of all sessions. Agreements were defined as those occasions when both observers coded the same activity for a staff person for the same observation. Interobserver agreement was calculated by dividing agreements by agreements plus disagreements and multiplying by 100. Overall interobserver agreement was 92.6%, with a range of 85.3% to 97.7%.

Scheduling Procedures and Research Design

An A-B-A-B reversal design with a 1-month follow-up was used to assess the effects of the intervention, which consisted of the following conditions.

Time-based scheduling (A). During baseline, the regular time-based schedule was in effect and the receptionist scheduled all patients at 15-min intervals. She followed only one rule: New patients were scheduled into the first time block in the morning and afternoon. All other patients were placed into available time slots. The receptionist gave the patient a choice of the times available during the day and scheduled the time closest to the patient's request.

Problem-based scheduling (B). During the problem-based scheduling intervention the receptionist was trained to assess the patient's presenting problem and was provided with a list of problems that could be considered "brief visit" problems. If there was ever any question of when to schedule the patient, the receptionist always scheduled them into the "long contact time" slots. Once the presenting problem was identified, the receptionist scheduled the patient according to the following guidelines:

1. 9:00 to 10:00 a.m. and 1:00 to 2:00 p.m.

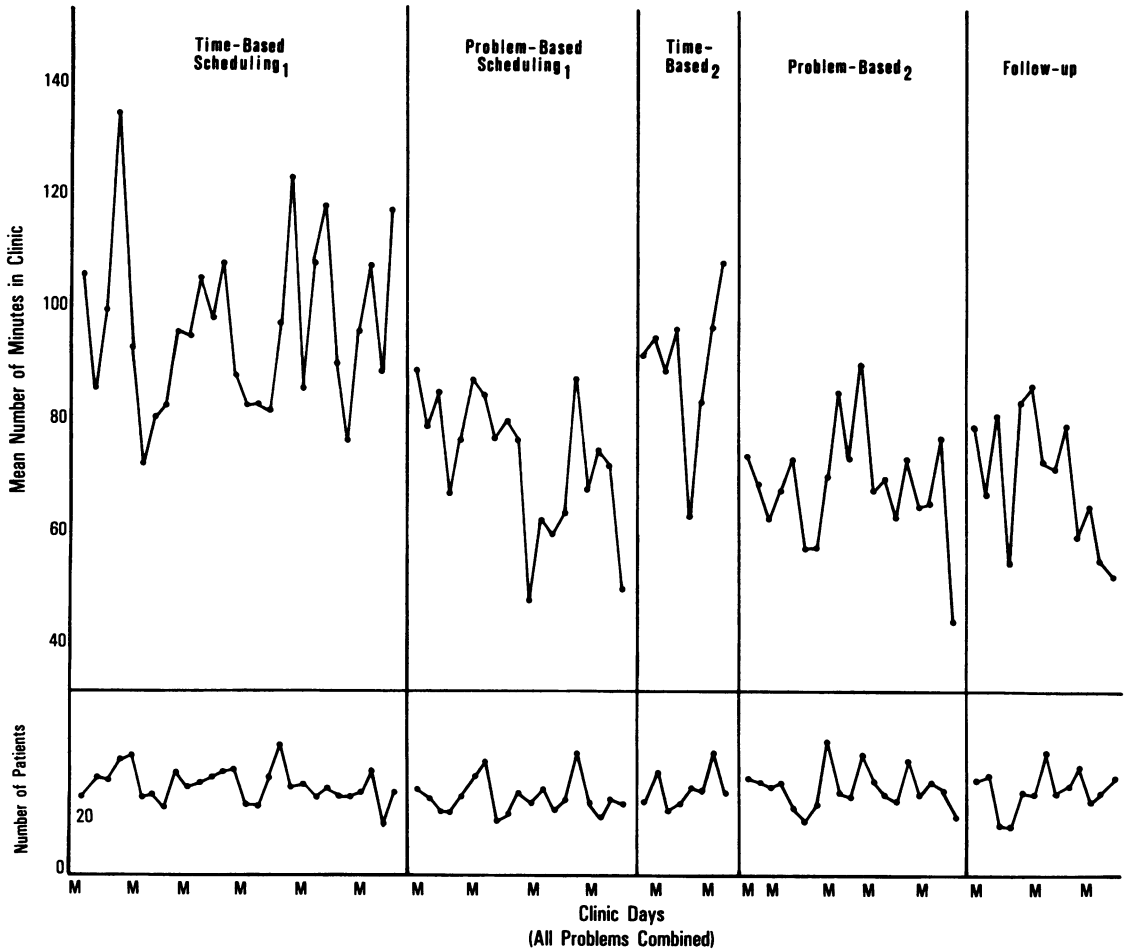


Figure 1. Mean number of minutes patients spent in clinic per day across all problems (top) and total number of patients seen per day (bottom). M indicates Monday of each week of the study.

were reserved for a maximum of two “long contact time” patients (e.g., new intakes, physicals), and a maximum of eight “short contact time” patients (e.g., ear aches; re-checks for ears, throat, glands, urinary tract infections; sore throats). No other problems were scheduled during these two time slots.

2. All other patients were evenly scheduled between 10:00 and 11:30 a.m. and 2:00 and 4:00 p.m. for 15 min each, except for well-baby visits, referrals, and physicals, which were allotted two 15-min slots. These time slots were determined from pilot data on the length of time required for each presenting problem. A maximum of 50 patients were scheduled per day.

Following intervention, the original baseline conditions were reintroduced for 9 days. The problem-based scheduling intervention was then reinstituted.

Follow-up. One month following the end of the second intervention, data were collected to assess maintenance of effects across time. The problem-based intervention was still in effect.

RESULTS

Patient Time Spent in Clinic

Figure 1 presents the mean number of minutes spent in clinic across phases for all patients seen on a given day and the total number of patients seen daily across phases. Under the original time-based

scheduling there was a great deal of variability across these 28 days in the mean number of minutes spent in clinic, with a range of 75.61 to 133.18 min. Implementation of the problem-based scheduling resulted in a decrease in the mean number of minutes spent in clinic, with daily means ranging from 48.60 to 88.47 min. Figure 1 shows that while there was an immediate decrease in mean number of minutes in clinic, maximum effect was not apparent until 10 days of the new scheduling procedure had passed. While number of minutes in clinic decreased during the initial intervention, there was no change in the number of patients seen (see bottom panel).

The return to time-based scheduling produced an increase in mean number of minutes per visit back to original baseline levels with the exception of one data point. The mean number of minutes spent in clinic in this phase ranged from 62.94 to 106.68. Reinstatement of the problem-based scheduling again reduced the number of minutes spent in clinic, with a range of 44.38 to 88.85. A 9-day follow-up demonstrated maintenance of the effects of problem-based scheduling 1 month after termination of the study.

The mean daily waiting times were assessed across five types of presenting problems: brief visits (e.g., ear aches), long visits (e.g., intakes), miscellaneous visits (e.g., school-age check-ups), sick-child visits (e.g., sore throats), and well-baby visits (e.g., scheduled, routine pediatric care for well children ages 0–5 years). The patterns of change for these problems were almost identical to that for all problems combined.

Staff Utilization of Time

Table 1 shows the percentage of time staff spent with patients, in patient-related activities (charting, discussing a patient's case with other staff in person or by phone), and in nonpatient-related activities (using the phone for nonpatient-related conversation, waiting, miscellaneous activity, out of clinic). These percentages are shown across experimental phases and show a decrease in proportion of time with patient during the intervention phases relative to baseline phases. Proportion of time spent on

Table 1
Percentage of Time Staff Spent in Patient-Related Activities

Experimental phase	Behaviors		
	% Time with patients	% All patient activities	% Nonpatient time
Time-based	44.16	59.69	16.22
Problem-based	38.43	58.66	22.84
Time-based	42.79	60.80	17.72
Problem-based	34.40	54.88	22.02
Follow-up	33.95	52.11	24.09

patient-related activities shows a similar trend. Conversely, an increase in nonpatient-related time is apparent during the intervention phases compared with baseline.

Consumer Satisfaction Questionnaire

Table 2 presents the findings on the consumer satisfaction measure. Overall, these data showed important differences across phases on only two variables. Only the questions on waiting showed consistent changes related to the intervention. The question "How did you find your wait in the waiting room?" produced a difference in the response ("I found the wait in the waiting room too long") between the original time-based scheduling and the first application of problem-based scheduling. There were no important differences across the remainder of the phases of the study on this question. As the study progressed, fewer patients found the wait in the exam room "too long" regardless of phase of the study and the objective data on waiting time. Almost 64% indicated that they were "very satisfied" with the medical care received by their child across phases of the study.

DISCUSSION

Results of this study demonstrated that patient waiting time in a medical clinic can be reduced by manipulating environmental antecedents. Additionally, no deterioration in perceived quality of care was found in the responses to a consumer questionnaire.

Table 2
Consumer Satisfaction Responses (%)

Question	Experimental phases				Follow-up
	Baseline	Scheduling	Baseline	Scheduling	
1. How was the wait in waiting room?					
Too long	15.57	7.23	21.55	16.30	16.20
About right	58.20	63.84	58.01	63.50	62.50
No wait	26.23	29.93	20.44	20.20	21.30
2. How was the wait in exam room?					
Too long	22.14	20.61	18.13	16.46	13.36
About right	51.79	58.11	62.64	62.78	62.07
No wait	16.07	21.28	19.23	20.78	24.57
3. Were you satisfied with medical care?					
Very satisfied	64.17	65.56	64.94	58.99	63.49
Satisfied	35.00	34.11	33.91	40.25	36.51
Not satisfied	0.83	0.33	1.15	0.76	0.00

Data on staff utilization of time also revealed interesting results. The proportion of time staff spent with patients decreased while the proportion of "extra" time increased during the three intervention phases. This extra time can be considered an efficiency measure for staff behavior, since its existence could allow clinics to schedule more patients or shorten operating hours. However, there is no guarantee that the time saved by staff will be used productively unless additional programming is arranged to produce and support such behavior.

Although it can be argued that reduced waiting time is a benefit for patients because of increased convenience and an increase in time available for other activities, other benefits are unclear at this time. Future research should focus on determining the kind and extent of benefits realized as a result of scheduling system changes. For example, it may be that care is improved if the professional staff are able to spend longer periods in treatment without pressure from waiting patients.

The cost effectiveness of the problem-based scheduling system is also noteworthy. Although no formal cost data were collected, it is clear that the changes evidenced were produced at little cost to the clinic. The receptionist was trained to identify presenting problems in a short time. Additionally, reprogramming the problem-based schedule into

the computer required only a few minutes on one occasion.

Use of the problem-based system in other clinics appears feasible. Initially, staff or administrators need to develop problem categories relevant to their clinic and determine the approximate time required to treat each problem. Problems requiring similar amounts of time could be grouped together and scheduling guidelines determined.

It should be noted that the problem-based scheduling system and antecedent interventions in general assume a minimum skill level on the part of staff. Within the clinic setting in this study, staff members who scheduled patients were capable of categorizing presenting problems and arranging appointments of appropriate lengths. In settings in which the system would be implemented by inexperienced staff, additional training would probably be needed. At a minimum, staff would be required to question patients at the time of appointment, determine the specific nature of the problem, and select an appropriate appointment length.

From a systems perspective, this study provides useful information concerning antecedent control. The manipulation of a general antecedent variable was found to be an effective method of reducing patient time in clinic and increasing time available for staff without the direct manipulation of con-

sequences. There is a need to explore other systems-level interventions, in that other similar applications could provide a means of improving the efficiency of staff members through simple programming.

REFERENCES

- Green, H. G., Dudding, B. A., Viren, M. A., & Leake, H. C. (1977). The pediatric clinic: Diagnosing inefficiencies and measuring the effects of remedial action. *Clinical Pediatrician*, *16*, 541-547.
- Iwata, B. A., Bailey, J. S., Brown, K., Foshee, J., & Alpern, M. (1976). Modification of institutional staff behavior using a performance-based lottery. *Journal of Applied Behavior Analysis*, *9*, 417-431.
- Motil, K. J., & Siar, W. J. (1973). Patient response toward a change in the system of mental health care delivery. *Pediatrics*, *52*, 289-293.
- Roberts, S. D. (1977). Improving primary care clinics' effectiveness through assessment. *Hospitals*, *51*, 123-133.
- Rochart, J. F., & Hofmann, P. B. (1969). Physicians and patient behavior under different scheduling systems in a hospital outpatient department. *Medical Care*, *7*, 463-470.
- Smith, S. R., & Smith, H. T. (1984). *Scheduling patients in an ambulatory care center: A study of methods and development of a computer model for resource studies*. Paper presented at the Ambulatory Pediatric Conference, Washington, DC.
- Sulzer-Azaroff, B. (1982). Behavioral approaches to occupational health and safety. In L. W. Frederiksen (Ed.), *Handbook of organizational behavior management* (pp. 505-538). New York: Wiley.
- Todd, N. M. (1984). *Assessment and intervention strategies for increasing efficiency in a pediatric clinic*. Unpublished manuscript, West Virginia University, Morgantown, WV.

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